STATUS OF CLAIMS

As Amended by Response to Office Communication of 06/22/2004

Claims 1 – 19 Have now been canceled.

New Claims 20 – 59 are hereby newly submitted

Claims 20, 31, 41, 45, 53, and 58 are Independent method claims. Each of the other newly submitted claims is dependent from one of these independent claims.

In accordance with the preferred Patent Office procedures the newly presented claims, commencing with Claim 20, are shown on separate sheets, and each new claim is identified after the claim number as being a new claim.

20. [New] A method of measuring motion within a fluid body comprising the steps of:

(a) injecting a plurality of solid particles into the fluid body in dispersed relation to move therewith;

(b) applying a short pulse of light through an objective lens to the fluid body so as to broadly illuminate the fluid body, and then repeating the application of the light pulse after a known time delay;

(c) after each pulse of the impinging light, observing through the same objective lens the light scattered from the individual solid particles;

(d) wherein only light from the solid particles lying within the depth of field of the objective lens will produce well-focused discrete images of discrete particles, thereby determining a two-dimensional measurement plane in the flowing fluid; and

(e) comparing discrete images of discrete particles successively observed in the measurement plane as a function of time to determine the motion of the fluid body.

21. [New] The method of Claim 20 wherein an image recording device is positioned to receive light transmitted from the test device through the objective lens for recording discrete images of discrete particles.

22. [New] The method of Claim 20 wherein the images of discrete particles are observed to determine two vectorial components of the measurement field.

23. [New] The method of Claim 20 wherein the wavelength of the light lies within the range of ultraviolet to infrared.

24. [New] The method of Claim 23 wherein the wavelength of the light is within the ultraviolet range.

25. [New] The method of Claim 23 wherein the wavelength of the light is within the infrared range.

26. [New] The method of Claim 23 wherein the wavelength of the light is within the visible range.

27. [New] The method of Claim 20 wherein the light pulses are applied at periodic intervals and the comparison is accomplished by analyzing a successively recorded time sequence of discrete images of discrete particles by average correlation analysis at multiple points within the image field to determine the average fluid velocities of multiple respective points within the two-dimensional measurement plane.

28. [New] The method of Claim 27 wherein the images of discrete particles are observed to determine two vectorial components of the measurement field.

29. [New] The method of Claim 20 wherein the light pulses are applied to a half-silvered mirror, and are reflected from the mirror into the fluid body.

30. [New] The method of Claim 29 wherein an image recording device is positioned to receive light transmitted from the test device through the objective lens and the mirror, for recording discrete images of discrete particles.

31. [New] A method of measuring motion within a fluid body comprising the steps of:

(a) injecting a plurality of solid particles into the fluid body in dispersed relation to move therewith;

(b) periodically applying short pulses of light with a known time separation to a mirror so as to be reflected from the mirror through an objective lens into the fluid body so as to then broadly illuminate the fluid body;

(c) after each pulse of impinging light, observing through the same objective lens the light scattered from the individual solid particles, whereby only light from the solid particles lying within the depth of field of the objective lens will produce well-focused discrete images of discrete particles, thereby determining a two-dimensional measurement plane in the flowing fluid; and

(d) then comparing successively observed discrete images of discrete particles as a function of time to determine the motion of the fluid body.

32. [New] The method of Claim 31 wherein an image recording device is positioned to receive scattered light transmitted through the objective lens for recording discrete images of discrete particles.

33. [New] The method of Claim 32 wherein the images of discrete particles are observed to determine two vectorial components of the measurement field.

34. [New] The method of Claim 31 wherein the wavelength of the light lies within the range of ultraviolet to infrared.

35. [New] The method of Claim 34 wherein the wavelength of the light is within the ultraviolet range.

36. [New] The method of Claim 34 wherein the wavelength of the light is within the infrared range.

37 [New] The method of Claim 34 wherein the wavelength of the light is within the visible range.

38. [New] The method of Claim 31 wherein the comparison is accomplished by analyzing a successively recorded time sequence of discrete images of discrete particles by average correlation analysis at multiple points within the image field to determine the average fluid velocities of multiple respective points within a two-dimensional measurement plane.

39. [New] The method of Claim 38 wherein the images of discrete particles are observed to determine two vectorial components of fluid velocity.

40. [New] The method of Claim 31 wherein the duration of the pulses of light is of the order of five nanoseconds, and the known time separation between pulses is in the approximate range of several nanoseconds to several seconds.

41. [New] A method of measuring motion within a fluid body comprising the steps of:

(a) selecting fluorescent solid particles having a known excitation wavelength and an known emission wavelength;

(b) injecting a plurality of the fluorescent solid particles into the fluid body in dispersed relation to move therewith;

(c) repetitively applying a pair of short pulses of light at the excitation wavelength with a known time delay between the pulses to broadly illuminate the fluid body;

(d) after each pair of pulses of the impinging light, observing light emitted from the individual solid particles at the emission wavelength through an objective lens, whereby only light from the solid particles lying within the depth of field of the objective lens will produce well-focused discrete images of discrete particles, thereby determining a two-dimensional measurement plane in the flowing fluid; and

(e) then comparing successively observed discrete images of discrete particles at the emission wavelength as a function of time to determine the motion of the fluid body.

42. [New] The method of Claim 41 wherein the pulses of impinging light are applied through an objective lens having a high numerical aperture, and the emitted light is observed through the same objective lens.

43. [New] The method of Claim 41 wherein the images of discrete particles at the emission wavelength are observed to determine two vectorial components of the measurement field.

44. [New] The method of Claim 41 wherein the pair of short pulses of light with a known time delay between them are applied at periodic intervals, and the comparison is accomplished by analyzing a successively recorded time sequence of discrete images of discrete particles by average correlation analysis at multiple points within the image field to determine the average fluid velocities of multiple respective points within a two-dimensional measurement plane.

45. [New] A method of measuring motion within a fluid body comprising the steps of:

(a) selecting solid particles that will follow the motion of the fluid body;

(b) injecting a plurality of the solid particles into the fluid body in dispersed relation to move therewith;

(c) repetitively applying a short pulse of light at periodic intervals to broadly illuminate the fluid body;

(d) after each pulse of the impinging light, observing light scattered from the individual particles through an objective lens, whereby only light from the solid particles lying within the depth of field of the objective lens will produce well-focused discrete images of discrete particles, thereby determining a two-dimensional measurement plane in the flowing fluid; and

(e) then comparing successively observed discrete images of discrete particles as a function of time to determine the motion of the fluid body.

46. [New] The method of claim 45 wherein the pulses of impinging light are applied through an objective lens having a high numerical aperture, and the scattered light is observed through the same objective lens.

47. [New] The method of claim 45 wherein the images of discrete particles are observed to determine two vectorial components of the measurement field.

48. [New] The method of claim 46 wherein the images of discrete particles are observed to determine two vectorial components of the measurement field.

49. [New] The method of Claim 45 wherein the wavelength of the light lies within the range of ultraviolet to infrared.

50. [New] The method of Claim 49 wherein the wavelength of the light is within the ultraviolet range.

51. [New] The method of Claim 49 wherein the wavelength of the light is within the infrared range.

52. [New] The method of Claim 49 wherein the wavelength of the light is within the visible range.

53. [New] A method of measuring with approximately microscale spatial resolution the velocity of a flowing fluid, the method comprising the steps of:

(a) injecting into the fluid a plurality of solid particles that approximately follow the motion of the flowing fluid,

(b) selecting a light source for repetitively delivering closely spaced pulses of light having a known duration of the order of five nanoseconds, and a known time delay between the spaced pulses in the approximate range of several nanoseconds to several seconds;

(c) positioning a microscope objective lens having a known depth of field to transmit pulses of light from the light source into the flowing fluid and positioned to image within the flowing fluid;

(d) gathering pulses of light, scattered by the solid particles contained within the flowing fluid, through the same microscope objective lens;

(e) relaying the gathered pulses of light from the objective lens to an image recording device, thereby recording discrete images of discrete particles;

(f) wherein only light from the solid particles lying within the depth of field of the objective lens will produce well-focused discrete images of discrete particles that are recorded by the image recording device, thereby determining a two-dimensional measurement plane in the flowing fluid; and

(g) which further includes the step of analyzing a successively recorded time sequence of discrete images of discrete particles by average correlation analysis at multiple points within the image field to determine the average fluid velocities at multiple respective points within the two-dimensional measurement plane.

54. [New] The method of Claim 53 wherein the wavelength of the light lies within the range of ultraviolet to infrared.

55. [New] The method of Claim 54 wherein the wavelength of the light is within the ultraviolet range.

56. [New] The method of Claim 54 wherein the wavelength of the light is within the infrared range.

57. [New] The method of Claim 54 wherein the wavelength of the light is within the visible range.

58. [New] A method of measuring motion within a fluid body comprising the steps of:

(a) applying a short pulse of light through an objective lens to the fluid body so as to broadly illuminate the fluid body, and then repeating the application of the light pulse after a known time delay;

(b) after each pulse of the impinging light, observing discrete images of discrete particles lying within the depth of field of the objective lens; and

(c) comparing discrete images of discrete particles that are successively observed in a two-dimensional measurement plane defined by the depth of field of the objective lens as a function of time to determine motion of the fluid body.

59. [New] The method of claim 58 wherein the discrete images of discrete particles are observed through the same objective lens.

Favorable action is solicited.

October 22, 2004

Respectfully submitted,

Gene W. Arant
Attorney for Applicants
Registration Number 17, 936

Gene W. Arant
Registered Patent Attorney
P.O. Box 269
Lincoln City, OR 97367
Tel: (541) 764-3300
Fax: (541) 764-3308
Email: gwapat@wcn.net